2363 WD
10-5-04

DC2001 - Foss Waterway Remediation

302 E. 11th St. Tacoma, WA 98421
253-502-2193
Fax: 253-573-1927

Transmittal

TO:

U.S. Environmental Protection Agency
US EPA, Region 10
1200 6th Avenue, MS ECO-083
Seattle, WA 98101-3188
ATTN: **John Malek**

FAX: **206-553-1775**
PAGES:
DATE: **10/5/2004**

SUBJECT: **August 2004 Monthly Water Quality Monitoring Report**

FROM:

Iain Wingard
Floyd Snider McCarthy
83 South King Street, Suite 614
Seattle, WA 98104

PHONE: 206-292-2078
FAX: 206-682-7867
MOBILE: (b) (6)

ITEMS TRANSMITTED:

Qty	Item	Description

REMARKS:

Please find enclosed the Monthly Water Quality Report for August 2004. Included in the report is the monthly summary report and all daily reports, which are revised to include all TSS and metals laboratory reports.

If you have any questions regarding the information contained in this report, please give me a call at (206) 595-7402. If you have any comments regarding the report, please forward them to us.

Sincerely,

Iain Wingard

CC:

Cross-References
Water Quality Monitoring Log # WQM-0182.00

Date: 10/6/2004 7:00:41AM

Correspondence CR-1453

Water Quality Monitoring Log #: WQM-0182.00

302 E. 11th St. Tacoma, WA 98421
Job: **DC2001 Foss Waterway Remediation**

253-502-2193
Fax: 253-573-1927

To: **KPFF Consulting Engineers - Bill Conley**
101 Stewart Street
Suite 800
Seattle, WA 98101

SEP 13 2004
RECEIVED

Submitted: 9/10/2004
Reply requested by: 9/24/2004
First submittal ☑
Re-submittal ☐

From: **Manson Construction - Lloyd, Michael**

Subject: **August 2004 Final Monthly WQM Report**

Item	Qty	Spec #	Section #	Description	Design Status	CM Team Status
		1-01010	1.14 D-1	1. Water Quality Monitoring FSP/QAPP; August 2004 Final Monthly report		

CONTRACTOR CERTIFICATION:

☐ We have verified that the material or equipment contained in this submittal meets all plan and Specification requirements, including coordination with all related work, specified or shown (no exceptions).

Date: _____ Signed: _____

CM TEAM REPLY:

Cross-References

cc: Craig Williamson - KPFF; Deb Sweet - CoT; Iain Wingard - FSM

Water Quality Monitoring Log #: WQM-0182.00

302 E. 11th St. Tacoma, WA 98421 253-502-2193
Job: **DC2001 Foss Waterway Remediation** Fax: 253-573-1927

August Monthly Report
WQ 08 09 04r
WQ 08 10 04r
WQ 08 11 04r
WQ 08 12 04r
WQ 08 13 04r
WQ 08 16 04r
WQ 08 17 04r
WQ 08 18 04r
WQ 08 19 04r
WQ 08 2 04r
WQ 08 20 04r
WQ 08 23 04r
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WQ 08 26 04r
WQ 08 27 04r
WQ 08 3 04r
WQ 08 30 04r
WQ 08 31 04r
WQ 08 4 04r
WQ 08 5 04r
WQ 08 6 04r

cc: Craig Williamson - KPFF; Deb Sweet - CoT; Iain Wingard - FSM

August 2004 - Water Quality Monitoring Summary

Thea Foss & Wheeler-Osgood Waterways
Remediation Construction Project

PREPARED FOR THE

CITY OF TACOMA
PUBLIC WORKS DEPARTMENT

MANSON CONSTRUCTION CO.

September 9, 2004

August 2004 - Water Quality Monitoring Summary

Thea Foss & Wheeler-Osgood Waterways
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MANSON CONSTRUCTION CO.

September 9, 2004

August 2004 Monthly Report

Table of Contents

I. Monitoring Summary

Water quality monitoring was conducted by the Water Quality Group in the Thea Foss and St. Paul Waterways. In the Thea Foss, remedial construction centered on the capping of RA19 sediments and capping at Martinac Shipyard. Work in the St. Paul included dredging at the south end of the waterway where the off-set berm will be constructed, and monitoring for the disposal of Martinac sediments. Additionally, visual water quality monitoring was conducted at Martinac Shipyard; Alber's Wharf Marina piling and float placement; and Johnny's Dock Marina sheetwall installation. Water quality monitoring events are summarized in Attachment 1.

Water quality monitoring on the water was conducted with the YSI Sonde at multiple sampling stations and depths as described in the Water Quality Field Sampling Plan and as amended by Water Quality Certifications and Technical Memoranda. The YSI Sonde is set up to measure Dissolved Oxygen (mg/L), Temperature (°C), Turbidity (NTU), Salinity (uS/cm); and depth (ft). Laboratory analyses were provided by STL (Fife, WA) for Total Suspended Solids (TSS) and metals (Copper and Silver). TSS Samples were collected with a Niskin sampler and submitted to the laboratory under chain-of-custody. Samples for dissolved metals analyses were collected with a Wheaton stainless steel sampler. Laboratory results are provided in individual daily reports (as amended, see Attachment 4).

During the month of August dissolved oxygen levels were consistently above the compliance criteria of 5.0 mg/L at all mixing zone monitoring stations and depths, including early warning stations closer to the work zones.

Salinity measurements showed some variability over the month. Low salinity water arises principally from input of fresh water from the Puyallup River and to a lesser extent from rainfall events. Measurement of salinity is not required under the contract, but in the interests of understanding the physical makeup of the water column, we found salinity to be a very useful tool for delineating fresh water contributions to water quality, particularly in the Thea Foss Waterway.

Monthly inspection reports for major equipment are included in daily water quality reports. Both the Andrew and Derrick 3 were inspected in August.

II. Assessment of Water Quality Measurements

Dissolved Oxygen

The YSI Sonde has proven to be a very stable platform for all measurements, including dissolved oxygen. The YSI Sonde is calibrated on a daily basis with frequent checks. As shown in the Attachment 2, pre-survey and post-survey calibration checks for dissolved oxygen were remarkably stable with a correlation coefficient (r) of 0.875 between pre-survey and post-survey conditions. Changes in calibration data for dissolved oxygen, arise from changes in barometric pressure and temperature, which have the effect of moderately changing the daily calibration. This effect is most obvious with the calibration changes observed in February 2004 and August 2004. Current calibration data corresponds remarkably well with data obtained in August of 2003.

Dissolved oxygen levels measured with the YSI Sonde correlate very well with dissolved oxygen levels measured on field samples analyzed by the Winkler Titration as shown in Attachment 3. The correlation coefficient for this data set is $r = 0.945$ since the beginning of this project. This data confirms that dissolved oxygen measurements are representative and accurately correlate with actual field conditions measured by the YSI Sonde. Attachment 3 also provides a plot of YSI Sonde DO measurements vs. Winkler Titration measurements. The major variability observed with dissolved oxygen measurements in the dissolved oxygen plot is believed to arise from temperature and salinity differences, which correlate with changing weather and intervals sampled (shallow, mid-depth, and deep).

Toward the end of August we have observed a gradual decline in dissolved oxygen levels in the waterways of this project. The major decline in mid-August appears to be a result of warmer water temperatures and declining barometric pressures. As temperatures continue to drop concurrent with seasonal changes, dissolved oxygen levels should again rise to winter maximums.

Salinity and Temperature

The YSI salinity probe is remarkably stable, and no problems have been observed. Although salinity is not required by project specifications or water quality certifications, salinity measurements provide useful insights to the water column and potential impacts on water quality. Low salinity is a particularly good

indicator of fresh water input. Salinity data are also good indicators of the extent of layering or mixing within the water column. We normally see salinity gradients in the water column with less saline water on the surface grading to more saline conditions with depth. For example, we have observed substantial mixing of the water column in association with vessel movement, shallow water, and low tide cycles.

Temperature measurements continue to be very stable, and no problems have been observed. Like salinity, Temperature is a useful tool to assess conditions in the water column. Temperature gradients (or the absence thereof) also provide confirmation of layering or mixing within the water column.

Turbidity

The YSI turbidity probe has proven to be remarkably stable. This instrument is calibrated daily using a 2-point standard curve at 0.0 and 11.2 NTU. This calibration range is appropriate for work conducted in August because the general range of observed turbidity is relatively low and the calibration range incorporates compliance criteria. Calibration and calibration checks are performed daily. No problems were observed in August.

During the month of August, sampling for Total Suspended Solids (TSS) was extensive. This data has been updated in individual daily reports.

Ambient Water Quality

During August the Water Quality Group conducted sampling of the Ambient Station at STA TF 30+00 in the Thea Foss Waterway and at SP 7+00 at the mouth of the St. Paul Waterway. Data gathered at these reference stations provides useful background information as well as a reasonable assessment of the overall impact of remedial construction on the Thea Foss and the St. Paul Waterways. Our data supports the conclusion that the remedial activities have had no measurable (DO, Turbidity, Salinity, Temperature, or TSS) impact on Commencement Bay water quality.

Dissolved Metals

During the 2003 – 2004 remedial construction season, the water quality group collected samples for dissolved metals (Copper and Silver only). These samples were collected with a Niskin sampler as directed by Bruce Titus (EPA) following the Puget Sound Environmental Protocols (PSEP). Sampling for dissolved metals was discontinued at the direction of EPA in early 2004 and reinstated by Iain Wingard (FSM) at the beginning of this remedial season.

The Niskin Sampler is easy to use and provides a substantial sample volume

although the Niskin sampler is difficult as evidenced by carry-over of Copper residues. The Niskin sampler is basically a plastic tube with stretched medical tubing inside the sampler to provide the snap to close the sampler when triggered by the traveler. Based on our experience of last year, we wanted to better understand the source(s) of dissolved Copper in the water column and decon samples. Dissolved Silver has not been detected in any water quality sample since the beginning of this project.

In order to ascertain the potential sources of dissolved copper, we conducted several modest experiments. These are described below:

Decon with Tap Water. During the sampling event of July 15, 2004 we employed tap water from the Manson Office to clean the Niskin sampler. A rinsate sample was collected with very interesting results. Tap water at our offices contained over 100 ug/L (0.1 mg/L) of dissolved copper (see Attachment 4).

Decon with Tap Water followed by Deionized Water. During the sampling event of July 22, 2004 we employed tap water (includes scrubbing with Alconox solution) from the Manson Office to clean the Niskin sampler. A rinsate sample was collected using deionized water. The rinsate sample still contained 24.6 ug/L of dissolved copper.

Sampling with the Wheaton Sampler. During all subsequent sampling events for July and August we used a stainless steel Wheaton sampler. The stainless steel sampler is considerably easier to clean and all subsequent results of decon samples confirm the efficacy of discrete sampling with minimal carryover between sampling events (see Attachment 4).

Recommendation. Although the Niskin sampler is the sampler of choice for TSS sampling because of ease of use and convenience in the field, we firmly believe that the Wheaton sampler provides a better sample of higher integrity when measuring low concentrations of dissolved copper. By analogy, we also believe that future "Chemicals of Concern" sampling, if any, should be conducted with the Wheaton sampler.

As shown in Attachment 4, dissolved copper levels in both the Thea Foss and St. Paul Waterway ranged from 12.5 to 42.4 ug/L. Over the past two months the average concentration of dissolved copper was approximately 20 ug/L. Silver was not detected in any sample. Simple statistics show that there is no correlation of dissolved copper with any measured parameter (DO, Turbidity, Salinity, or Temperature) although dissolved copper levels on the average tended to be slightly higher in the St. Paul Waterway (20.9 ug/L) than the Thea Foss Waterway (18.8 ug/L). See the next section for a brief discussion of this data set.

III. Statistical Analysis / Field Duplicate Measurements

Attachment 4 provides a unique data set summary of dissolved metals results in conjunction with other water quality data gathered during water quality monitoring events. Relatively simple statistical methods were employed for this data set representing sample results from mid-water column sampling intervals.

Water Quality Parameter Ranges/Averates

During July and August the average water temperature ranged from 13.4 to 13.7 degrees Centigrade. The St. Paul tended to be slightly warmer than the Thea Foss. The average Salinity ranged from 29.2 to 29.5 uS/cm. Dissolved Oxygen ranged from 7.1 to 7.8 mg/L with July slightly higher than August. The average Turbidity ranged from a low of 0.9 NTU in the St. Paul to 4.2 in the Thea Foss. Likewise, TSS ranged from 8.6 to 14.8 mg/L.

Temperature v. Salinity Comparison

There is a negative correlation ($r = -0.668$) between temperature and salinity. In other words, as the water temperature decreases the salinity tends to increase (as would be expected).

Dissolved Oxygen v.TSS/Turbidity Comparison

As might be expected, there is a modest negative correlation ($r = -0.630$) between Dissolved Oxygen and TSS. This correlation is less positive for DO and turbidity. In other words, as the amount of suspended matter increases, dissolved oxygen levels tend to decrease.

Turbidity v. TSS Comparison

As has been discussed in previous monthly reports, there is a modest positive correlation ($r = 0.524$) between our turbidity measurements and laboratory analyses for TSS.

Water Depth v.TSS/Turbidity Comparison

There is a modest negative correlation between Water Depth and TSS and

Depth and Turbidity (r = -0.603 and –0.412, respectively). This correlation suggests that the water gets deeper, turbidity and TSS measurements should decrease.

Field Duplicate Data

During the month of August field duplicate data was collected regularly. These data are provided in daily water quality reports. Field duplicate results appear to be consistent and representative of field conditions as measured by the YSI Sonde. Although the interval of sampling between field duplicates was typically only a matter of minutes, some variation was observed for all field measurements (Dissolved Oxygen, Temperature, Salinity, and Turbidity) and laboratory analyses of TSS samples.

Field duplicate data supports the conclusion that field measurements are reproducible with relatively minor variability. Based upon the reproducibility of field duplicate data, the largest variable appears to be associated with actual changes in the water column. Given that we are working in tidal waters where flow conditions change fairly rapidly at both maximum ebb and flood tides, this is not surprising.

A more detailed look at field duplicate data will be presented in the September Monthly Report.

IV. Look-Ahead for the September and October

Upcoming water quality work will largely focus on the south end of the Thea Foss Waterway in RA20, RA22 and potentially RA21. Dredging of these areas will be followed by capping work. As sediments are dredged they will be disposed in the St. Paul Waterway CDF area.

Work will continue at Johnny's Dock Marina where ACC Hurlen in installing the sheetpile wall.

Attachment 1

August Summary

Thea Foss / Wheeler Osgood Waterway
Water Quality Submittal Log

Event	Date	Vessel / Facility	Location	Work Activity
01	08/02/04	Martinac	Thea Foss Waterway	Place quarry spall
		Johnny's Dock	Thea Foss Waterway	Demolition of slope
		DB-3	Alber's Marina TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
02	08/03/04	Martinac	Thea Foss Waterway	Place quarry spall
		Johnny's Dock	Thea Foss Waterway	Demolition of slope
		DB-3	Alber's Marina TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
03	08/04/04	Martinac	Thea Foss Waterway	Place quarry spall
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	Alber's Marina TF Waterway	Pull pile / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
04	08/05/04	Martinac	Thea Foss Waterway	Under pier capping
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	Alber's Marina TF Waterway	Strip false work / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
05	08/06/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Pre-construction monitoring
06	08/09/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
07	08/10/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
08	08/11/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
09	08/12/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Martinac	Thea Foss Waterway	Habitat mix placement
		Water Bug	St. Paul Waterway	Offset berm construction
10	08/13/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Martinac	Thea Foss Waterway	Habitat mix placement
		Water Bug	St. Paul Waterway	Offset berm construction
11	08/16/04	Martinac	Thea Foss Waterway	Habitat mix placement
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Water Bug	St. Paul Waterway	Offset berm construction
12	08/17/04	Martinac	Thea Foss Waterway	Habitat mix placement
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
13	08/18/04	Martinac	Thea Foss Waterway	Habitat mix placement
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	Thea Foss Waterway	RA19 slope work
		Water Bug	Martinac TF Waterway	Shipway excavation
14	08/19/04	Martinac	Thea Foss Waterway	Timber / pile cutoff
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	Martinac TF Waterway	Timber / pile cutoff

Event	Date	Vessel / Facility	Location	Work Activity
15	08/20/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
16	08/20/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
	3 Qw	DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
17	08/24/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
18	08/25/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
19	08/26/04	Martinac	Thea Foss Waterway	Shipway excavation
		Water Bug	Martinac TF Waterway	Shipway excavation
			Thea Foss Waterway	RA19 cap placement
			St. Paul Waterway	CDF disposal from Martinac
20	08/27/04	Martinac	Thea Foss Waterway	Quarry spall placement
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
		Water Bug	Thea Foss Waterway	RA19 cap placement
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
21	08/30/04	Martinac	Thea Foss Waterway	Quarry spall placement
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
22	08/31/04	Water Bug	TF - Pick's Cove	Dredging
		Water Bug	St. Paul Waterway	CDF disposal from Pick's Cove
		Johnny's Dock	Thea Foss Waterway	Drive H piles
		Johnny's Dock	Thea Foss Waterway	Excavate sediments behind sheetwall
		CDF- St Paul	St. Paul Waterway	CDF disposal from Johnny's Dock
		DB-3	17th St. TF Waterway	Pile driving / assemble floats

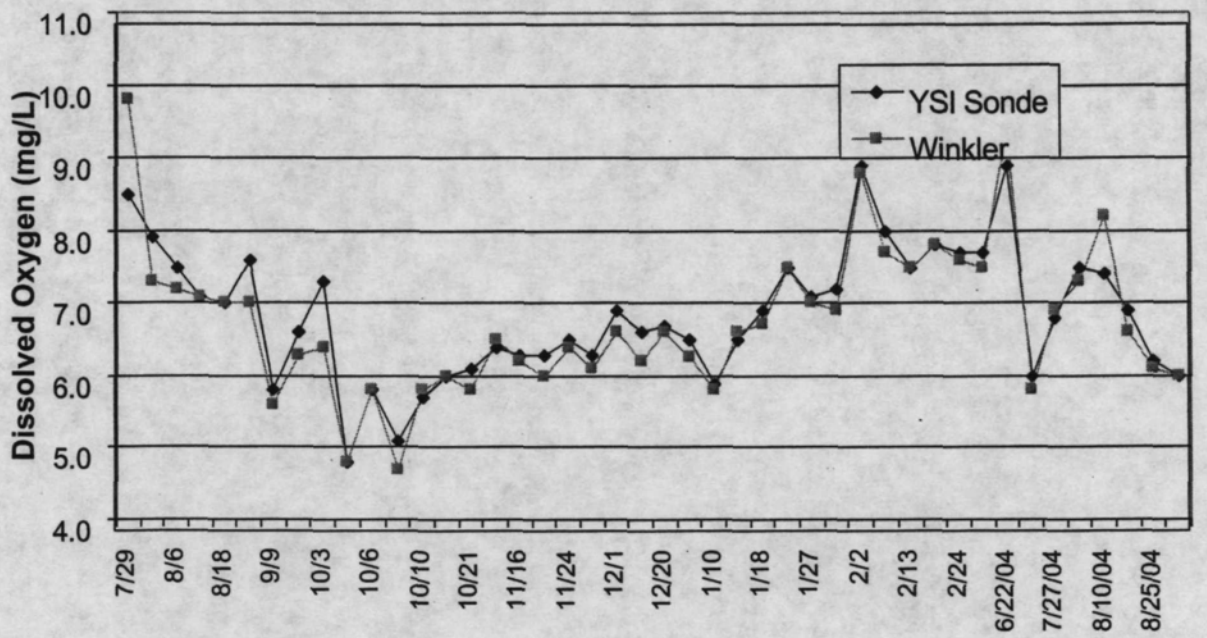
R. Michael Lloyd 9/7/04

R. Michael Lloyd
Manson Construction

Daily calibrations and calibrations checks yielded a correlation coefficient of 0.85 for pre and post-survey calibrations since the beginning of the project in 2003.

Field measurements of dissolved oxygen compare very favorably with Winkler titration results. The correlation coefficient(r) for the data set (beginning in August of 2003) 1s 0.952. The relative percent difference between the duplicate Winkler analyses is 2.7%, and the RPF between the Winkler result and the YSI field result is 2.7%.

YSI vs. Winkler / DO Comparison



AUG 03 - AUG 2004

Attachment 4 – Dissolved Metals / Statistical Analysis

The data set for dissolved metals samples taken in July and August 2004 are provided in this section.

Thea Foss - Wheeler Osgood Waterway
July and August 2004 - Dissolved Metals Data

SAMPLE NUMBER	LOCATION / DESCRIPTION	DEPTH ZONE	DEPTH (ft)	TEMP (°C)	SAL. (uS/cm)	DO (mg/L)	TURB. (NTU)	TIDAL FLOW	TSS (mg/L)	Cu (ug/L)	Ag (ug/L)
040715/TF60/M/A	Ambient Monitoring	Middle	11	13.3	29.3	7.3	7.7	LOW	17	12.6	1.0U
040715/TF30/M/A	Ambient Monitoring	Middle	14	12.7	30.2	7.1	0.6	LOW	17	13.8	1.0 U
040715/TF2/M/A	Ambient Monitoring	Middle	18	14.1	28.6	6.9	3.0	LOW	8	15.5	1.0 U
040715/SP7/M/A	Ambient Monitoring	Middle	14	14.1	27.2	7.2	11.3	Ebb	27	26.9	1.0 U
040722/RA19NE300/M/A	RA19 Capping	Middle	16	13.1	29.4	7.6	1.0	Ebb	4	42.4	2.0 U
040722/RA19N300/M/A	RA19 Capping	Middle	16	13.0	29.3	7.0	2.5	Ebb	5	15.1	2.0 U
040722/RA19NW300/M/A	RA19 Capping	Middle	16	12.9	29.6	7.1	2.2	Ebb	8	15.3	2.0 U
040722/RA19S300/M/A	RA19 Capping	Middle	16	13.3	29.0	7.2	1.8	Ebb	8	15.5	2.0 U
040722/RA19S150/M/A	RA19 Capping	Middle	16	13.1	29.2	7.1	2.1	Ebb	10	21.0	2.0 U
040722/RA19SW300/M/A	RA19 Capping	Middle	18	12.6	30.0	7.4	0.7	Ebb	5	16.8	2.0 U
040728/RA19 SE300/M/A	RA19 Capping	Middle	8	14.5	27.0	7.4	5.5	Flood	16	14.6	2.0 U
040728/RA19 S300/M/A	RA19 Capping	Middle	9	14.3	27.6	7.3	5.9	Flood	16	14.6	2.0 U
040728/RA19 S150/M/A	RA19 Capping	Middle	10	13.8	28.0	7.4	5.3	Flood	16	16.1	2.0 U
040728/RA19 N300/M/A	RA19 Capping	Middle	12	13.8	28.9	7.4	4.0	Flood	15	18.9	2.0 U
040728/RA19TF30/M/A	Ambient Monitoring	Middle	16	12.3	29.5	7.5	0.6	Flood	4	23.9	2.0 U
040805/RA19-NE 300/M/A	St Paul Waterway - Dredging	Middle	14	13.7	28.1	7.4	1.1	High	4	19.3	2.0 U
040805/RA19-N 300/M/A	St Paul Waterway - Dredging	Middle	14	13.9	27.6	7.3	1.8	High	6	18.9	2.0 U
040805/RA19-N 150/M/A	St Paul Waterway - Dredging	Middle	15	13.8	28.1	7.2	1.4	High	3	20.5	2.0 U
040805/RA19-SE 300/M/A	St Paul Waterway - Dredging	Middle	14	13.7	28.7	7.1	1.1	High	15	21.3	2.0 U
040805/RA19-S 300/M/A	St Paul Waterway - Dredging	Middle	15	13.7	28.8	7.2	1.1	High	20	22.8	2.0 U
040805/RA19-TF 30/M/A	Ambient Monitoring	Middle	19	13.1	29.8	7.5	0.2	High	3	27.7	2.0 U
040812/SP-NE 300/M/A	St Paul Waterway - Dredging	Middle	9	13.7	29.9	8.3	0.6	Flood	5	21.4	2.0 U
040812/SP-N 300/M/A	St Paul Waterway - Dredging	Middle	12	13.5	29.9	8.4	0.7	Flood	6	20.8	2.0 U
040812/SP-NW 300/M/A	St Paul Waterway - Dredging	Middle	10	13.8	29.8	8.3	0.2	Flood	7	19.2	2.0 U
040812/SP-NW 300/M/A/Q	St Paul Waterway - Dredging	Middle	10	13.7	30.0	8.2	0.6	Flood	20	19.7	2.0 U
040812/SP-N150/M/A	St Paul Waterway - Dredging	Middle	13	13.9	29.3	8.5	1.6	Flood	8	20.3	2.0 U
040812/SP-7+00/M/A	Ambient Monitoring	Middle	19	13.3	30.2	8.0	0.6	Flood	6	19.4	2.0 U
040820/RA19-NE300/M/A	RA19 Capping	Middle	16	13.8	29.6	6.8	1.4	High	10	15.7	2.0 U
040820/RA19-NW 300/M/A	RA19 Capping	Middle	12	14.0	29.2	6.9	6.5	High	18	16.5	2.0 U
040820/RA19-SE 300/M/A	RA19 Capping	Middle	12	14.0	29.2	7.0	3.4	High	10	16.9	2.0 U
040820/RA19-SW 300/M/A	RA19 Capping	Middle	14	13.9	29.6	7.2	1.0	High	7	17.2	2.0 U
040820/RA19-NW 150/M/A	RA19 Capping	Middle	12	14.1	29.1	7.1	12.5	High	13	16.7	2.0 U
040820/TF30/M/A	Ambient Monitoring	Middle	19	13.2	30.2	7.4	1.0	High	5	18.2	2.0 U
040820/TF30/M/AQ	Ambient Monitoring	Middle	19	13.2	30.2	6.8	1.0	High	3	19.1	2.0 U

040826/MS-NE 300/M/A	Martinac Shipyard Excavation	Middle	11	13.0	30.2	6.0	5.7	Low	31	31.2	2.0 U
040826/MS-NW 300/M/A	Martinac Shipyard Excavation	Middle	9	13.1	30.0	6.1	3.5	Low	33	23.3	2.0 U
040826/MS-SW 300/M/A	Martinac Shipyard Excavation	Middle	9	13.2	29.9	6.1	2.3	Low	27	17.6	2.0 U
040826/MS-SW 300/M/A	Martinac Shipyard Excavation	Middle	8	13.1	30.0	6.0	4.5	Low	22	17.0	2.0 U
040826/MS-W150/M/A	Martinac Shipyard Excavation	Middle	9	13.2	29.6	5.9	22.8	Low	29	17.0	2.0 U
040826/TF30/M/A	Ambient Monitoring	Middle	14	13.1	30.1	6.3	0.3	Low	21	17.0	2.0 U
040826/TF30/M/AQ	Ambient Monitoring	Middle	14	13.1	30.2	6.2	2.8	Low	23	17.4	2.0 U

040715/TF2/R/A	Decon Sample/COT Tap Water Rinse with Niskin Sampler	109	1.0 U
040722/RA19NE300/M/AR	COT Tap Water with DI Rinse with Niskin Sampler	24.6	2.0 U
040728/RA19TF30/D/A/R	Decon Sample collected from Wheaton Sampler with DI after cleaning	2.8	2.0 U
040805/RA19TF 30/D/AR	Decon Sample collected from Wheaton Sampler with DI after cleaning	2.1	2.0 U
040812/SP7/M/AR	Decon Sample collected from Wheaton Sampler with DI after cleaning	2.0 U	2.0 U
040820/TF30/M/AR	Decon Sample collected from Wheaton Sampler with DI after cleaning	2.0 U	2.0 U
040826/TF30/D/AR	Decon Sample collected from Wheaton Sampler with DI after cleaning	2.0 U	2.0 U

Monitoring Averages	Depth (ft)	TEMP (°C)	SAL. (uS/cm)	DO (mg/L)	TURB. (NTU)	TIDAL FLOW	TSS (mg/L)	Cu (ug/L)	Ag (ug/L)
St. Paul Waterway Averages =	13.7	13.7	29.2	7.8	0.9	N/A	8.6	20.9	N/A
Thea Foss Averages =	13.4	13.4	29.3	6.9	4.2	N/A	14.8	18.8	N/A
July Averages =	14.0	13.4	28.9	7.3	3.6	N/A	11.7	18.9	N/A
August Averages =	13.2	13.5	29.5	7.1	3.1	N/A	13.7	19.7	N/A
Corrrlation of Temperature v.	-6.000	1.000	-0.668	0.266	0.205	N/A	0.006	-0.192	N/A
Corrrlation of Salinity v.	0.173	-0.668	1.000	-0.135	-0.247	N/A	0.034	0.077	N/A
Corrrlation of Dissolved Oxygen v.	0.139	0.266	-0.135	1.000	-0.397	N/A	-0.630	0.101	N/A
Corrrlation of Turbidity v.	-0.412	0.205	-0.247	-0.397	1.000	N/A	0.524	-0.121	N/A
Corrrlation of TSS v.	-0.603	0.006	0.034	-0.630	0.524	N/A	1.000	-0.008	N/A
Corrrlation of Copper v.	0.155	-0.192	0.077	0.101	-0.121	N/A	-0.008	1.000	N/A
Corrrlation of Depth v.	1.000	-0.340	0.173	0.139	-0.412	N/A	-0.603	0.155	N/A

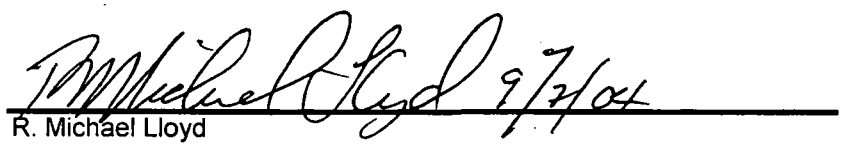
Attachment 5
Updated Daily Reports

Daily reports have been updated with TSS and Dissolved Metals results from STL Laboratory. These updated reports are provided on a CD-ROM under separate cover

Thea Foss / Wheeler Osgood Waterway
Water Quality Submittal Log

Event	Date	Vessel / Facility	Location	Work Activity
01	08/02/04	Martinac	Thea Foss Waterway	Place quarry spall
		Johnny's Dock	Thea Foss Waterway	Demolition of slope
		DB-3	Alber's Marina TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
02	08/03/04	Martinac	Thea Foss Waterway	Place quarry spall
		Johnny's Dock	Thea Foss Waterway	Demolition of slope
		DB-3	Alber's Marina TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
03	08/04/04	Martinac	Thea Foss Waterway	Place quarry spall
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	Alber's Marina TF Waterway	Pull pile / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
04	08/05/04	Martinac	Thea Foss Waterway	Under pier capping
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	Alber's Marina TF Waterway	Strip false work / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
05	08/06/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Pre-construction monitoring
06	08/09/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
07	08/10/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
08	08/11/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
09	08/12/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Martinac	Thea Foss Waterway	Habitat mix placement
		Water Bug	St. Paul Waterway	Offset berm construction
10	08/13/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Martinac	Thea Foss Waterway	Habitat mix placement
		Water Bug	St. Paul Waterway	Offset berm construction
11	08/16/04	Martinac	Thea Foss Waterway	Habitat mix placement
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Water Bug	St. Paul Waterway	Offset berm construction
12	08/17/04	Martinac	Thea Foss Waterway	Habitat mix placement
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	St. Paul Waterway	Offset berm construction
13	08/18/04	Martinac	Thea Foss Waterway	Habitat mix placement
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	Thea Foss Waterway	RA19 slope work
		Water Bug	Martinac TF Waterway	Shipway excavation
14	08/19/04	Martinac	Thea Foss Waterway	Timber / pile cutoff
		Alber's Marina	Thea Foss Waterway	Drive steel float pile
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		Water Bug	Martinac TF Waterway	Timber / pile cutoff

Event	Date	Vessel / Facility	Location	Work Activity
15	08/20/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
16	08/20/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
17	08/24/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
18	08/25/04	Johnny's Dock	Thea Foss Waterway	Drive sheet pile
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
19	08/26/04	Martinac	Thea Foss Waterway	Shipway excavation
		Water Bug	Martinac TF Waterway	Shipway excavation
			Thea Foss Waterway	RA19 cap placement
			St. Paul Waterway	CDF disposal from Martinac
20	08/27/04	Martinac	Thea Foss Waterway	Quarry spall placement
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Water Bug	Thea Foss Waterway	RA19 cap placement
		Water Bug	Thea Foss Waterway	RA19 cap placement
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
21	08/30/04	Martinac	Thea Foss Waterway	Quarry spall placement
		DB-3	17th St. TF Waterway	Pile driving / assemble floats
		Johnny's Dock	Thea Foss Waterway	Drive sheet pile
22	08/31/04	Water Bug	TF - Pick's Cove	Dredging
		Water Bug	St. Paul Waterway	CDF disposal from Pick's Cove
		Johnny's Dock	Thea Foss Waterway	Drive H piles
		Johnny's Dock	Thea Foss Waterway	Excavate sediments behind sheetwall
		CDF- St Paul	St. Paul Waterway	CDF disposal from Johnny's Dock
		DB-3	17th St. TF Waterway	Pile driving / assemble floats



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TARGET SHEET

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